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ABSTRACT

Studies show that while most clinicians agree on seven critical reading activities--instant word recognition, word meanings, oral reading, silent reading comprehension, listening comprehension, and attention/motivation--they reveal little agreement on the diagnoses and suggestions for remediation of reading problems. The computer assisted instruction (CAI) case simulation system is designed to improve diagnostic agreement through computer assisted training. Presenting five simulated case studies, the CAI program directs students to systematically collect data, using diagnostic reports and checklists. It then compares students' diagnoses with expert opinions. Besides allowing student diagnosticians to practice on a large number of representative cases, the training studies permit effective control over learning and reliabilitiy testing conditions by presenting equivalent forms to each of the five case studies. A simulation system such as the CAI model is usable in a reading diagnosis course sequence without modification of the curriculum, considerable cost, or additional staff and training. (MM)

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Computer Based Simulated Cases as a Tool for Teaching Reading Diagnosis

Ruth M. Polin & John F. Vinsonhaler

Introduction

The work reported here is based upon two series of studies conducted in the Institute for Research on Teaching (IRT). The first series of six studies investigated the diagnostic and remedial performance of reading and learning disabilities specialists and classroom teachers. The basic task for the 66 participants in the studies was to diagnose simulated cases of reading or learning disability, and to suggest an initial remediation plan. There are two related findings across all these studies: (1) commonality (the extent to which clinicians made the same statements about a case) is very low; most statements in the written diagnoses and remediations for a given case were mentioned only once. (2) individual agreement (between two diagnoses of the same case) was also very low. Mean diagnostic agreement (number of common statements divided by the total number of statements made for the same case) among highly experienced clinicians was 0.10 across the six studies. In a study of remediation, the results for individual remedial agreement were similar to those for diagnosis. Further, remediations appeared to be uncorrelated with diagnoses (Vinsonhaler, Weinshank, Wagner, & Polin, 1983). As a result of these observational studies, we discovered that most clinicians agreed upon seven categories which we call critical reading performances. They are: instant word recognition, decoded word recognition, word meanings, oral reading, silent reading comprehension, listening comprehension, and attention/motivation.

The purpose of the present paper is to discuss the relation of these two sets of studies to the design of computer support systems for improving diagnostic agreement through training.

Methods and Results

On the basis of the training studies reported in Vinsonhaler, Weinshank, Polin, & Wagner, 1983, we believe that any training procedure of the type we have used can be defined in terms of the answers to four questions:
What model of reading is used? What decision aids are used to help guide data collection and diagnosis? What cases are presented for diagnosis? What provision is made for feedback on the "correctness" of the diagnosis?

1. What model of reading is used?

In the studies quoted above, a skills model of reading was employed. The foundation of this approach was the student's capacity to perform adequately on the critical reading tasks previously enumerated, i.e., instant word recognition, decoded word recognition, word meanings, oral reading, silent reading comprehension, listening comprehension, and attention/motivation. In our judgment any model of reading and learning to read which leads one to propose specific decisions on diagnosis and remediation would serve as an adequate base in terms of providing reliable decisions.

2. What decision aids are used to help guide data collection and diagnosis?

The decisions aids used in the studies were in the form of (1) diagnostic report forms which directed students to consider systematically all reasonable diagnostic categories, and (2) checklists (to convert diagnosis to a standard vocabulary). These decision aids were based upon the Problem Oriented Medical Record approach (Weed, 1976) and the DeDombal information collection methods (DeDombal, Leaper, Horrocks, Staniland & McCann, 1974). Thus, the aids serve a two-fold purpose. First, they force the diagnostician to structure the collection and aggregation of further information in terms of the problem(s) uncovered in the initial survey. Our decision aids were based upon the skills model.

Hence, they systematized the diagnosis in terms of the critical reading performances previously described. In our judgment the particular model used is less important than the emphasis on systematization provided by the decision aids.

3. What cases are presented for diagnosis?

Several characteristics have been suggested as important in clinical training. Good training is said to provide (1) practice on as many cases as possible, (2) a variety of cases, and (3) cases representative of a clinician's caseload. The five simulated cases used in our studies were based upon the problems of five real children. Consultants and experienced clinicians judged these cases to be typical of those encountered by reading specialists. All cases in the Training Studies were presented using BASIC programs on DEC PDP8 minicomputers with disk storage. Graphics (such as original test booklets) were available in an accompanying Study Guide. The cases used in our studies meet most of the criteria of good training cases except that they were simulated rather than real. The simulated case, however, has certain advantages in training for diagnostic agreement. First, all cases are completely consistent. There is no "random" variation in the child's response to questions or test items. Further, each of the five cases has an equivalent form (the same case superficially disguised). This permits good control over the training and reliability testing conditions. Second, the cost of presenting a case is very low (at most about 50 cents per student hour). In terms of the results in our diagnostic training experiments, simulated cases seem to provide a good basis for diagnostic training in reading as well as in medicine where they are extensively used.

4. What provision is made for feedback on the "correctness" of the diagnosis? Our training studies have involved two methods of providing corrective feedback. The concensus method simply compares the student's written diagnosis with that of a group of judges (e.g., the other students). After the diagnosis is converted to a standard checklist, a statistic can be calculated. The tutorial method consists of an instructor reviewing the diagnostic report in terms of the model of reading used in the instruction. The latter method is the one that has been used most effectively by us and proven effective in the improvement of diagnostic reliability (Vinsonhaler, Weinshank, Polin, & Wagner, 1983).

In our studies, tutorial feedback was provided by human instructors. After analyzing the interactions between students and preceptors we believe that Computer Aided Instruction (CAI) could be successfully used to replace the human instructor in terms of providing evaluation of diagnosis. Although the last of the training studies (Polin, 1981) used a minicomputer system, we have since developed a system for a microcomputer Apple II Plus using a BASIC program we call Dialog. Based on our skills model, a student clinician can be taken through a simulated case by means of collection of data on each of the seven critical reading performances and the underlying causal factors commonly associated with them. In one presentation a student can collect this data in a systematic manner, make a diagnosis and receive immediate descriptive feedback on that diagnosis by comparison with an expert's diagnosis stored on the disk. Such a case simulation system can improve the student's opportunity to practice diagnosis with corrective feedback while the model of reading can be presented in the traditional instructional mode, i.e., via lectures and printed materials. Such a system is usable in a reading diagnosis course sequence without

modification of the curriculum, considerable cost or additional staff and training. We developed our system on an Apple computer but we are planning additional versions on other computer systems and hope to add voice input/output.

Summary

In general, the CAI Case Simulation system as used in our Training Studies worked very well. Students readily responded to the computer cases. They sat individually or in small groups at the minicomputer, requested information from an inventory of available cues, recorded results and wrote up their diagnostic agreement results on the decision aid form. Learning did, in fact, occur since diagnostic agreement increased from an average of 0.10 found in earlier observational studies to an average 0.70 for critical reading performances by the end of the training studies.

The success and problems of the CAI Simulation System have led us to propose a set of specifications for a state-of-the-art case simulation system for the training of reading specialists. Such a system, we reason, would have three objectives. The first objective is to give proper training for inservice and preservice reading teachers embodying the effective three fold elements of a model of process, decision aids, and practice with feedback. Our data indicate that traditional instructional methods can effectively serve to present the model of reading, but we believe CAI is needed mainly to improve the students' opportunity to practice diagnosis with corrective feedback. Here we see CAI primarily in terms of case simulation.

The second objective is for the case simulation system to be usable as a module in a reading diagnosis course sequence without modification of the curriculum. Presumably, the system would be used in conjunction with additional reading diagnosis courses which include training on a model of reading suitable for diagnostic decision making. Obviously, the particular model of reading may vary from the critical reading performance model used by us.

In summary, the use of microcomputers as case simulators seems to be an excellent choice for educators who are interested in microcomputers uses in education. Although this type of application is not new, the Institute for Research on Teaching findings on diagnostic agreement bring into focus the potential of case simulation in the training of teachers and reading specialist.

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